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(54) Title: AQUEOUS CLEANING COMPOSITION (57) Abstract Non-foaming, low foaming and high foaming liquid, aqueous cleaning compositions which comprise the components potassium hydroxide; sodium metasilicate; an additional sodium ion containing component, preferably sodium hydroxide or a polyacrylic acid neutralized with sodium hydroxide; alkyl diglycol, preferably butyl diglycol or butyl acetate; a quaternary alkylbenzyl ammonium chloride, preferably lauryl dimethyl benzyl ammonium chloride; and optionally foaming agents, fragrances and additives; which components are dissolved in water in effective amounts.		

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AQUEOUS CLEANING COMPOSITION

Technical field of the invention

This invention relates to aqueous cleaning compositions. More particularly it relates to synthetic, liquid low and high foaming cleaning compositions which contain alkali builders, surfactants, disinfectants, and optionally foaming agents and various additives, dissolved in water. The cleaning compositions of the present invention are particularly well suited for the cleansing of articles heavily soiled and stained with oil and fat.

Background of the invention

Liquid cleaning products containing some of the active ingredients used in the compositions of the invention are known. EP 0,124,489 (Henkel) discloses a cleaning composition which is used to remove protective polymeric films from metallic surfaces. The formulation is based on a combination of di- and triethanolamine and a hydrotropic compound, e.g. butyldiglycol, and pH-regulating acids, thickeners, tensides, corrosion inhibitors, biocides and optionally colouring agents. An embodiment of the invention comprises a mixture consisting of 7 % of triethanolamine, 2 % of butyldiglycol, 1 % of lauryl dimethyl benzyl ammoniumchloride and 0,4 % of phosphoric acid.

US 4,540,505 (Frazier) teaches a disinfective pump-spray cleanser containing a germicidally effective quaternary ammonium compound, a non-ionic surfactant, d-limonene, an alkali builder, aliphatic glycol monoethers, water and optionally a lower aliphatic alcohol. An embodiment of the cleanser comprises 6 % of ethylene glycol monobutyl ether, 0.9 % of n-alkyldimethyl ammoniumchloride and 1 % of sodium metasilicate. In another embodiment 4 % of diethylene glycol monobutyl ether is used. All compositions contain d-limonene and a non-ionic surfactant.

US 5,061,395 (Meng) relates to a hard surface cleaning composition which contain i.a. quaternary ammonium halides and sodium hydroxide. The quaternary ammonium chloride may be a C₁₂₋₁₈ n-alkyl dimethyl benzyl ammoniumchloride.

The present cleaning compositions of this invention are formulated with the use of commercially available substan-

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ces in a unique combination which makes the present cleaning compositions novel and provide surprisingly efficient cleaning properties. The invention provides both high and low foaming cleaning compositions, all of which have the same outstanding
5 cleaning properties. The cleaning compositions of the present invention are well suited for industrial production in small as well as large scales.

The present cleaning compositions can be utilised with excellent cleaning results e.g. in slaughterhouses to
10 clean equipment soiled with organic substances such as blood and fats; in fish processing plants to clean off marine oils and fats, remainings of fish entrails and other types of soils; the cleansing of fish crates, fish-nets and trawls; in mechanical workshops and garages to remove mineral oils, etc.
15 Furthermore, they are very efficient when used to wash house fronts, remove floor polishes without use of scrubbing, clean soot off constructions damaged by fire, etc. The present cleaning compositions may also be used for to launder textiles, e.g. overalls heavily stained with oil and grease.

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Summary of the invention

Accordingly, it is a purpose of this invention to provide an aqueous, cleaning composition comprising the components potassium hydroxide, sodium metasilicate, an additional
25 component containing sodium ions, an alkyl diglycol and/or an ester thereof, a quaternary alkylbenzyl ammonium chloride, and optionally foaming agents, fragrances and additives, dissolved in water in effective amounts.

30 Detailed description of the invention

This invention relates to liquid, aqueous cleaning compositions prepared by combining commercially available components. The formulations of non-foaming, low foaming and high foaming cleaning compositions of the invention are de-
35 scribed hereafter.

The alkali hydroxides used in the formulations of the cleaning compositions are preferably potassium hydroxide or sodium hydroxide. Most preferred is potassium hydroxide which is used in all formulations as an obligatory component. Com-

mercial grades of potassium hydroxide may be used, either in the form of a dry powder or, preferably, in the form of a 46 % by weight concentrated aqueous solution. In general, the quantity used is in the range from 0.5 to 20 % by weight of the 46 % by weight solution.

Sodium metasilicate, being an obligatory component, is preferably used in the form of a powder of a commercially available grade. Typical quantities used in the formulations are within the range from 2 to 15 % by weight.

According to the invention an additional quantity of sodium ions is needed to achieve the intended cleaning effect. In the low foaming cleaning compositions a preferred compound is sodium hydroxide, which is easily available at low costs. When used, the quantities are typically in the range from 0.2 to 10 % by weight of the total formulation.

In high foaming cleaning compositions it is preferred to use polyacrylic acid neutralized with sodium hydroxide (commercially available from Rohm & Haas, USA, under the trademark "Norasol LMW 45 N"). This compound may be used in quantities preferably in the range from 3 to 5 % by weight. This compound acts as a complexing agent which binds dissolved dirt.

An efficient cleaning composition for use within food processing plants must in addition to having a cleaning effect also be a disinfectant. Suitable germicidal agents for use in the present cleaning compositions are quaternary alkyl benzyl ammonium halides, preferably n-alkyl dimethyl benzyl ammonium chloride wherein the n-alkyl contains from 12 to 18 C atoms. Most preferred is lauryl dimethyl benzyl ammoniumchloride (commercially available as a 10 % by weight aqueous solution from Henkel, Germany, under the trademark "Dehyquart LDB"). This compound is a bactericide which have a good germicidal effect. In addition it stabilizes the obtained foam and improves its consistency, and also functions as a surfactant. A suitable amount in the formulations is from 1 to 5 % by weight of the 10 % by weight solution.

Alkyl diglycol and/or an ester thereof is an essential component of the present cleaning compositions. Compounds having different alkyl radicals may be used. However, the pre-

ferred compounds are butyl diglycol (butoxy ethoxy ethanol) and butyl diglycol acetate. The most preferred compound is butyldiglycol, preferably used in a quantity from 3 to 10 % by weight. Commercially available grades may be used as purchased.

The ingredients must be dissolved in an appropriate amount of water to obtain the required cleaning properties. The production of the cleaning compositions is performed by first dissolving potassium hydroxide, sodium metasilicate, and optionally sodium hydroxide, in a minor quantity of water, and then added to this mixture lauryl dimethyl benzyl ammonium-chloride and butyl diglycol.

An efficient non-foaming, cleaning composition thus comprises:

Potassium hydroxide	0.5 - 20 wt%
Sodium metasilicate	2 - 15 wt%
Sodium hydroxide	0.2 - 10 wt%
Butyl diglycol	3 - 10 wt%
Lauryl dimethyl benzyl ammonium-chloride (10 wt% solution)	1 - 5 wt%
Water, up to a total of	100 wt%

To obtain a smooth, homogenous consistency of the low foaming cleaning composition the active components indicated above should amount to no more than 57 % by weight, and consequently the added amount of water is not more than 43 % by weight. In the industrial production of the present cleaning compositions it may be practical to reduce the amount of water as much as possible in order to reduce packaging and shipping costs. Prior to use the concentrated cleaning compositions then have to be diluted with appropriate amounts of water. When the cleaning composition is used to clean normally soiled articles, prior to use the concentrated cleaning compositions indicated above are diluted with water in a ratio of about 1:10. For the washing of lightly soiled articles the cleaning compositions may often be diluted with up to 1000 parts of water and still have a sufficient cleaning effect. Obviously, there exist no strict rules for the dilution, and the user

must decide upon the degree of dilution in each specific case.

In order to increase the efficiency of the cleaning compositions and to make them more user-friendly, at least a minor amount of foam is often desired. This is obtained by adding a suitable foaming agent. A preferred agent which produces a tough foam is coconut fatty acid diethanolamide (commercially available from company Henkel, Germany, under the trademark "Comperlan KD"), which can be added in a quantity of typically about 3 % by weight in low foaming compositions and up to about 30 % by weight in high foaming compositions.

The cleaning compositions should also leave a fresh and pleasant scent upon cleaning. This is easily achieved by adding one of the many different fragrances available for this purpose. Among the most popular odours are lemon and pine. The latter scent can be obtained by adding green soap of commercially available grades. In addition, the green soap will boost the foaming and is therefore preferred. The green soap is included in the formulation in an amount of about 5 % by weight, but lower as well as higher amounts can be used.

Thus, according to a particularly preferred embodiment of the invention there is provided a cleaning composition which comprises the following ingredients:

25	Potassium hydroxide	7	wt%
	Sodium metasilicate	3	wt%
	Sodium hydroxide	0.5	wt%
	Butyldiglycol	8	wt%
30	Lauryl dimethyl benzyl ammonium chloride (10 wt%)	1	wt%
	Coconut fatty acid diethanolamide	3	wt%
	Green soap	5	wt%
	Water	72.5	wt%

35 A high foaming cleaning composition can be prepared by increasing the amount of foaming agent to e.g. approximately twice the amount used in the low foaming cleaning composition above. The preferred foaming agent is the above-men-

tioned coconut fatty acid diethanolamide.

In order to build up foam and stabilize the cleaning composition, a suitable coconut alkylamine compound having a hydrotropic effect may be used. A preferred compound is coconut iminoglycinat or N-cocoalkyl trimethylene diamine reacted with sodium chloroacetate (commercially available from Berol Nobel, Sweden, under the trademark "Ampholak XCE"). Alternatively, the sodium salt of N-coco- β -iminodipropionic acid (commercially available from Berol Nobel, Sweden, under the trademark "Ampholak YCA/P") may be used. Another foam-stabilizing agent is alkylphenol polyglycolether (of the type commercially available from Thor's Kemiske Fabrikker, Norway, under the trademark "Thorofen 3D 9kz"). Each of these compounds can be used alone, or a combination of two or all three of them can be used. The total amount of these compounds typically add up to about 10 % by weight of the formulation. According to a preferred embodiment of the invention there is used simultaneously 4 % by weight of coconut iminoglycinate and 5 % by weight of alkylphenol polyglycolether. The foam can be made thicker by adding sodium lauryl ethersulphate (commercially available as a 10 % by weight aqueous solution from Henkel, Germany, under the trademark "Texapon NSO") in a quantity of up to 10-20 % by weight (of the 10 wt% solution). The efficiency of the high-foaming cleaning composition may be further improved by adding about 3 % by weight of tetrasodium methylene diamine tetraacetate (commercially available as a 86 % by weight aqueous solution from Hampshire Chemicals, UK, under the trademark "Detarex 200"). This substance has a softening effect on the soil.

Thus, the high foaming cleaning composition of the invention is obtained by adding suitable amounts of the above mentioned foam building components to the low foaming composition described herebefore. The resulting cleaning composition gives an abundant amount of stable, persisting foam. Consequently, according to another embodiment of the invention there is provided a high foaming cleaning composition which comprise the following ingredients:

	Potassium hydroxide (46 wt%)	8	wt%
	Sodium metasilicate	1-5	wt%
5	Polyacrylic acid neutralized with sodium hydroxide	3-5	wt%
	Butyl diglycol	8	wt%
	Lauryl dimethyl benzyl ammonium chloride (10 wt%)	1-2	wt%
10	Coconut fatty acid diethanolamide	10-30	wt%
	Green soap	5	wt%
	Coconut iminoglycinate	4	wt%
	Sodium lauryl ethersulphate (10 wt%)	10-20	wt%
	Tetrasodium ethylenediamine tetraacetate (86 wt%)	3	wt%
15	Alkyl phenol polyglycol ether	5	wt%
	Water	up to a total of	100 wt%

The cleaning compositions of the present invention may be applied to soiled surfaces by conventional methods, for instance by spraying. Only low foaming cleaning compositions can be applied with the use of spraying devices that operates at low pressures (up to 600 kPa), because high foaming cleaning compositions require high pressures. To clean small articles even a hand-operated spraying device, consisting of a container and a sprayer connected thereto, may suffice. The cleaning composition must remain on the substrate to be cleaned for a given period of time, typically from 10 s to a couple of minutes, depending on how dirty the article is. To achieve a germicidal effect the cleaning compositions must remain in contact with the substrate for at least 9 minutes. Heavily stained and soiled articles may require a contact time of up to about 20 minutes. Finally, the cleaning composition is removed with water, and the article is clean. There is no need for brushing or scrubbing.

The following examples, wherein all percentages are by weight, illustrate the invention:

ExamplesExample 1 Non-foaming cleaning composition.

In a vessel equipped with a stirrer 3 kg of sodium metasilicate, 0.5 kg of sodium hydroxide and 7 kg of potassium hydroxide (46 % by weight aqueous solution) were dissolved in 80.5 kg of water. To this solution were added under continued stirring 8 kg of butyldiglycol and 1 kg of lauryl dimethyl benzyl ammoniumchloride (commercially available from Henkel, Germany, under the trademark "Dehyquart LDB"). During mixing the temperature in the solution was maintained at no less than 50°C. When the mixture had become homogenous, it was cooled to ambient temperature.

Example 2 Low-foaming cleaning composition.

A mixture according to Example 1 was prepared, except that the ingredients were added in the quantities indicated below. To this mixture were added coconut fatty acid diethanolamide (commercially available from Henkel, Germany, under the trademark "Comperlan KD") and green soap. The prepared cleaning composition comprised the following ingredients:

Potassium hydroxide	6 kg
Sodium metasilicate	8 kg
Sodium hydroxide	4 kg
Butyl diglycol	5 kg
Lauryl dimethyl benzyl ammoniumchloride ("Dehyquart LDB")	1 kg
Green soap	5 kg
Coconut fatty acid diethanolamide ("Comperlan KD")	3 kg
Water	68 kg

A low foaming cleaning composition was obtained which had a fresh odour and a smooth and homogeneous consistency.

Examples 3 and 4 High foaming cleaning compositions.

The same ingredients as in Example 2 were used, except that polyacrylic acid neutralized with sodium hydroxide (commercially available from company Rohm & Haas, USA, under

the trademark "Norasol LMW 45 N") was substituted for sodium hydroxide. In addition the foaming and foam-stabilizing agents sodium lauryl ethersulphate (commercially available from company Henkel, Germany, under the trademark "Texapon NSO"), tetrasodium ethylene diamine tetraacetate (commercially available under the trademark "Detarex 200"), alkylphenol polyglycol-ether (commercially available from company Thor's Kemiske Fabrikker, Norway, under the trademark "Thorofen 9 Kz"), and N-cocoalkyl trimethylene diamine sodium chloroacetate (commercially available from Berol Nobel, Sweden, under the trademark "Ampholak XCE") were added. The cleaning compositions included the following ingredients:

	<u>Ex. 3</u>	<u>Ex. 4</u>
15 Potassium hydroxide (46 wt%)	8 kg	8 kg
Sodium metasilicate	2 kg	2 kg
Polyacrylic acid neutralized with sodium hydroxide	3 kg	5 kg
Butyl diglycol	8 kg	8 kg
20 Lauryl dimethyl benzyl ammoniumchloride	1 kg	2 kg
Green soap	5 kg	5 kg
Coconut fatty acid diethanolamide	10 kg	3 kg
Coconut iminoglycinate	4 kg	4 kg
25 Sodiumlauryl ether sulphate (10 wt%)	20 kg	10 kg
Tetrasodium ethylenediamine	3 kg	3 kg
Alkylphenol polyglycol ether	5 kg	3 kg
Water	31 kg	45 kg

Example 5

30 Use of the cleaning compositions of Examples 2 and 3.

The low foaming cleaning composition of the invention and a commercially available cleaning composition ("Addi Kraft SU 930" from Lilleborg Fabrikker, Norway) were sprayed onto concrete walls soiled with remainings from the handling and processing of fish. Both cleaning compositions were kept in contact with the substrate for about 9 minutes and were then rinsed off with water under high pressure. The part of the wall to which the present cleaning composition had been app-

lied regained its original colour, whereas "Addi Kraft" left a gray coloured coating on the wall.

In a slaughterhouse for poultry the high foaming cleaning composition of the invention and "Addi Kraft SU 930" where sprayed at low pressure onto stainless steel sheets soiled with brown poultry fat. The cleaning compositions were allowed to act on the fat for a few minutes and were then removed by rinsing with water. The stainless steel sheets to which the present cleaning composition had been applied became completely clean, whereas the sheets to which the comparative composition had been applied onto retained a highly visible coating of poultry fat.

Example 6

Use of the cleaning composition of Example 2.

The low foaming cleaning composition of the invention and a commercially available cleaning composition ("HD-vask" from company Electrolux, Sweden) were applied to separate parts of a terrazzo floor in a block of flats. The cleaning compositions were allowed to act on the dirty floor for a few minutes, without any brushing or scrubbing, before being removed by the use of a swab. The part of the floor to which the cleaning composition of the present invention had been applied became completely clean. The other part of the floor to which "HD-vask" had been applied had to be scrubbed to obtain an acceptable result.

Example 7

Use of the cleaning composition of Example 2.

Each of the low-foaming cleaning composition of the invention and a commercially available cleaning composition ("Industrivask" from Nordan Olje) were applied to one half of the seat of a plastic chair that had remained in a mechanical workshop for a long period of time and had become very filthy. After a few minutes both halves of the seat were rinsed with water. While "Industrivask" only removed the soil from the top surface of the seat, the cleaning composition of the invention also removed soil from the tiny grooves in the seat.

Patent claims

1. A liquid, aqueous cleaning composition,
5 characterized by comprising the components potassium hydroxide; sodium metasilicate; an additional sodium ion containing component; an alkyl diglycol and/or an ester thereof; a quaternary alkylbenzyl ammonium chloride; and optionally foaming agents, fragrances and additives; dissolved in water
10 in effective amounts.
2. A cleaning composition according to claim 1, characterized in that the alkyl diglycol and/or the ester thereof is chosen from the group consisting of butyl diglycol
15 and butyl diglycol acetate.
3. A cleaning composition according to claim 1 or 2, characterized in that the quaternary alkyl benzyl ammonium chloride is lauryl dimethyl benzyl ammonium chloride.
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4. A cleaning composition according to any of claims 1 to 3, characterized in that the additional sodium ion containing component is sodium hydroxide.
- 25 5. A cleaning composition according to any of claims 1 to 4, characterized in that it comprises the following active components:
- | | |
|--|---------------|
| Potassium hydroxide (46 wt% solution) | 0,5 - 20 wt% |
| Sodium metasilicate | 2 - 15 wt% |
| 30 Sodium hydroxide | 0,2 - 10 wt% |
| Butyl diglycol | 3 - 10 wt% |
| Lauryl dimethyl benzyl ammoniumchloride
(10 wt% solution) | 1 - 5 wt% |
| Water | 93,3 - 43 wt% |
- 35 the total amounts of said components being equal to 100 wt%.
6. A cleaning composition according to any of claims 1 to 5, characterized in that it also comprises foaming agents, preferably coconut fatty acid diethanolamide and/or green

soap.

7. A cleaning composition according to any of claims 1 to 6, characterized in that it comprises the following components:

Potassium hydroxide (46 wt% solution)	7 wt%
Sodium metasilicate	3 wt%
Sodium hydroxide	0,5 wt%
Butyl diglycol	8 wt%
Lauryl dimethyl benzyl ammoniumchloride (10 %)	1 wt%
Coconut fat acid diethanolamide	3 wt%
Green soap	5 wt%
Water	72,5 wt%

8. A cleaning composition according to any of claims 1 to 3, characterized in that it also comprises foaming and foam stabilizing agents in quantities that resulting in a high foaming cleaning composition.

9. The cleaning composition of claim 8, characterized in that the additional sodium ion containing component is polyacrylic acid neutralized with sodium hydroxide.

10. A cleaning composition according to any of claims 8 and 9, characterized in that it comprises the following components:

Potassium hydroxide (46 wt% solution)	8 wt%
Sodium metasilicate	1 - 5 wt%
Polyacrylic acid neutralized with sodium hydroxide	3 - 5 wt%
Butyl diglycol	8 wt%
Lauryl dimethyl benzylammoniumchloride (10 wt% solution)	1 - 2 wt%
coconut fat acid diethanolamide	10 - 30 wt%
Green soap	5 wt%
N-cocoalkyl trimethylene diamine reacted with sodium chloroacetate	4 wt%

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Sodium laurylethersulphate (10 wt% solution)	10 - 20 wt%
Tetrasodium methylene diaminetetra acetate (86 wt% solution)	3 wt%
Alkylphenol polyglycolether	5 wt%
5 Water	up to a total of 100 wt%

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 95/00107

CLASSIFICATION OF SUBJECT MATTER

IPC6: C11D 3/00, C11D 3/08, C11D 7/06, C11D 1/62
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, CA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4540505 A (CHARLES FRAZIER), 10 Sept 1985 (10.09.85) ---	1-10
Y	US 4774015 A (ARCHY F. SLOVER), 27 Sept 1988 (27.09.88) ---	1-10
A	US 5061395 A (QUENTIN J. MENG), 29 October 1991 (29.10.91) -----	1-10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

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Patent document cited in search report		Publication date	Patent family member(s)		Publication date
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			AU-A-	8383382	25/11/82

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			JP-T-	5502683	13/05/93
			WO-A-	9109930	11/07/91

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